# Historic, Archive Document

Do not assume content reflects current
scientific knowledge, policies, or practices.

Reserve
1.96
R31Sn

U.S.

FEDERAL - STATE COOPERATIVE

SNOW SURVEYS AND IRRIGATION WATER FORECASTS



for

# Arizona

By

Division of Irrigation, Soil Conservation Service

United States Department of Agriculture

Data included in this report were obtained by the agency named above in cooperation with the Federal, State and local organizations listed on the last page of this report.

As of

Feb. 15, 1953

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

TO RECIPIENTS OF COOPERATIVE SNOW SURVEY
AND WATER SUPPLY FORECAST REPORTS:

Forecasts by U. S. Weather Bureau of total annual streamflow October-September, inclusive, at more than 300 gaging stations are issued monthly January through May in the publication WATER SUPPLY FORECASTS FOR THE WESTERN UNITED STATES.

Weather Bureau forecasts of runoff presented in this bulletin are computed from procedures based on mathematical analysis of the relation between precipitation and runoff.

The Weather Bureau bulletins may be secured by writing to:

Hydrologist in Charge
River Forecast Center
U. S. Weather Bureau
712 Federal Office Building
Kansas City 6, Missouri

# FEDERAL-STATE COOPERATIVE

# SNOW SURVEYS AND IRRIGATION WATER FORECASTS

# FOR

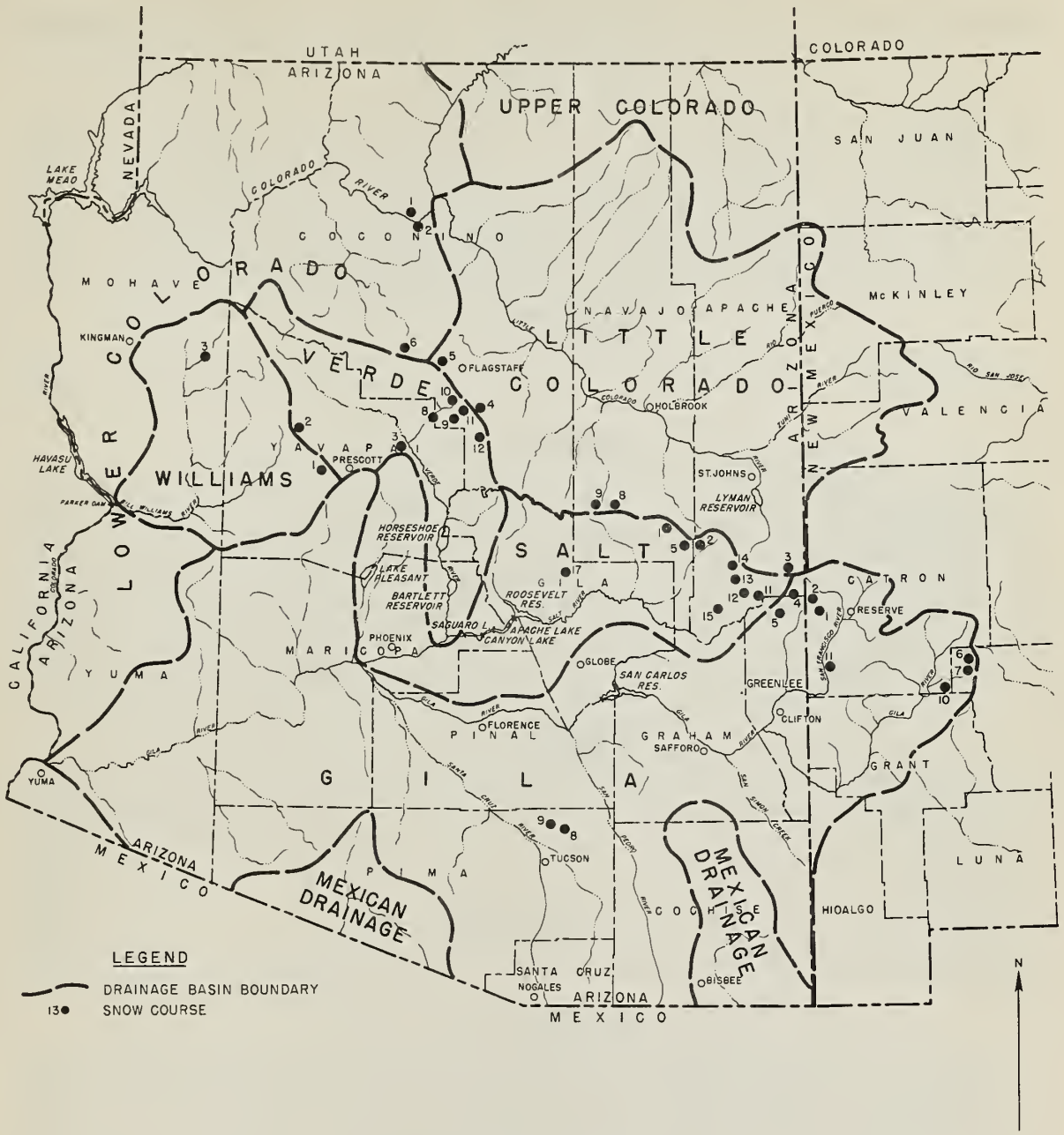
# ARIZONA

Report Prepared

by

Lee Griner - Snow Survey Leader

Division of Irrigation
Soil Conservation Service
Room 24, Post Office Building
Phoenix, Arizona




# ARIZONA
# COOPERATIVE SNOW SURVEYS

## SNOW COURSES AND DRAINAGE BASINS
## JANUARY 1953

0 40 80 120 160 200
SCALE IN MILES

AGR-SCS-ALBUQUERQUE, N. MEX. M-178 NOVEMBER 1952

INDEX TO SNOW COURSES

| NUMBER | NAME | ELEVATION |
|---|---|---|
| | **LITTLE COLORADO RIVER** | |
| 1. | Forest Dale | 6,000 |
| 2. | McNary | 7,200 |
| 3. | Nutrioso | 8,500 |
| 4. | Mormon Lake | 7,350 |
| 5. | Fort Valley | 7,350 |
| 8. | Heber | 7,600 |
| 9. | Canyon Creek | 7,500 |
| 11. | Mormon Mountain | 7,500 |
| 12. | Happy Jack | 7,630 |
| | **WILLIAMS RIVER** | |
| 1. | Iron Springs | 6,200 |
| 2. | Camp Wood | 5,700 |
| 3. | Willow Ranch | 5,000 |
| | **GILA RIVER** | |
| 1. | Frisco Divide (N.M.) | 8,000 |
| 2. | State Line (N.M.) | 8,000 |
| 3. | Nutrioso | 8,500 |
| 4. | Coronado Trail | 8,000 |
| 5. | Beaver Head | 8,000 |
| 6. | Taylor Creek (N.M.) | 7,850 |
| 7. | Inman (N.M.) | 7,800 |
| 8. | Rose Canyon | 7,300 |
| 9. | Bear Wallow | 8,100 |
| 10. | Black Canyon (N.M.) | 6,790 |
| 11. | Mogollon (N.M.) | 7,000 |
| | **VERDE RIVER** | |
| 1. | Iron Springs | 6,200 |
| 2. | Camp Wood | 5,700 |
| 3. | Mingus Mountain | 7,100 |
| 4. | Morman Lake | 7,350 |
| 5. | Fort Valley | 7,350 |
| 6. | Chalender | 7,100 |
| 8. | Munds Park | 6,500 |
| 9. | Casner Park | 6,930 |
| 10. | Antelope Park | 7,300 |
| 11. | Mormon Mountain | 7,500 |
| 12. | Happy Jack | 7,630 |
| | **SALT RIVER** | |
| 1. | Forest Dale | 6,000 |
| 2. | McNary | 7,200 |
| 3. | Nutrioso | 8,500 |
| 4. | Coronado Trail | 8,000 |
| 5. | Milk Ranch | 7,000 |
| 8. | Heber | 7,600 |
| 9. | Canyon Creek | 7,500 |
| 11. | Big Lake Knoll | 8,800 |
| 12. | Maverick Fork | 9,050 |
| 13. | Baldy | 9,000 |
| 14. | Ft. Apache | 9,160 |
| 15. | Pacheta | 7,800 |
| 17. | Workman Creek | 6,900 |
| | **LOWER COLORADO RIVER** | |
| 1. | Bright Angel | 8,400 |
| 2. | Grand Canyon | 7,500 |
| 5. | Fort Valley | 7,350 |
| 6. | Chalender | 7,100 |

# WATER SUPPLY OUTLOOK

Arizona
February 15, 1953

* * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*Snow surveys as of this date indicate the runoff *
*potential on the Salt is only about 43 percent of *
*normal, on the Verde only about 17 percent of nor- *
*mal, and about 15 percent of normal on the Gila. *
*This is a revision downward over previous fore- *
*casts. *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * *

## Precipitation, Temperature and Wind Conditions

Precipitation during January and the first half of February has been considerably below normal, almost to the point of complete absence, averaging only about 25 percent of normal over the snow country. Temperatures have been about 5 degrees above average. There have been several days of high wind conditions that have taken their toll through evaporation. Freezing and thawing have been almost daily occurrences in the snow areas, and much of the moisture is being lost through sublimation, and very little water is now moving off. The weather forecast for the period February 15 through March 15 for Arizona is below normal precipitation and above normal temperature. In view of these conditions, the runoff outlook is not good, and forecasts as of this date are being revised sharply downward.

## Snow Cover

### Salt River Watershed

Snow-stored water on the Salt River drainage as of this date is about 55 percent of normal. Snow-stored water varies from about 0.3 inches at the 7,000-foot level around McNary to about 6 inches of water in the 9,000-foot level of Mt. Baldy. In the Mogollon Rim area around Heber the snow-stored water averages about 0.7 inches. The Beaver Head-Coronado Trail area averages about 0.7 inches of snow-stored water. Snow depths in these areas vary from 0 to about 17 inches. Soil moisture conditions have been excellent but this condition is beginning to deteriorate. Even though snow-stored water averages about 55 percent of normal, above described weather and field conditions warrant a runoff forecast of only about 43 percent of normal or about 140,000-150,000 acre feet on the Salt for the period February through May.

Verde River Watershed

Snow depths on the Verde watershed vary from scattered traces in the Casner Park area to about 8 inches on Mormon Mountain, averaging 2.6 inches, about 23 percent of normal. The average snow-stored water is about 0.9 inches, or about 24 percent of normal. Soil moisture conditions are rapidly deteriorating. Even though snow-stored water averages about 24 percent of normal, above described weather and field conditions warrant a runoff forecast of only about 17 percent of normal, or about 40,000 acre feet for the period February through May.

Gila River Watershed

Prospects for runoff into the Gila River are not even as good as those on the Salt and Verde Rivers. There still remains an average of 2.2 inches of snow and 0.6 inches of snow-stored water on the Gila watershed, but soil moisture conditions have worsened. In view of the present conditions, and the long range weather forecast, the outlook for runoff is for only 15,000 to 20,000 acre feet on the Gila for the period February through May.

Other Drainages

Snow-stored water on the Little Colorado is about 15 percent of normal. The Williams River watershed shows no snow-stored water. The North Rim of the Grand Canyon reports 20 inches of snow and 6 inches of snow-stored water. The South Rim reports 1.4 inches of snow with 0.4 inches of snow-stored water.

## Runoff and Reservoir Storage

Runoff in January and the first 15 days in February added about 30,000 acre feet to the Salt River reservoirs, and about 32,000 acre feet to the Verde River reservoirs. The total present storage in the Salt-Verde system is about 1,392,000 acre feet, which is 178 percent of the 10-year average. This is the only bright outlook, but it is significant.

The San Carlos has only some 6,000 acre feet or about three percent of normal. This means very little water for irrigation.

The Carl Pleasant Reservoir on the Agua Fria River has about 82,000 acre feet or about 630 percent of normal, largely a result of late fall rains.

Lake Havasu contains 588,000 acre feet; Lake Mohave 1,574,000 acre feet; and Lake Mead 18,800,000 acre feet.

TABLE 1

ARIZONA SNOW SURVEYS FEBRUARY 15, 1953

| DRAINAGE BASIN and SNOW COURSE | LOCATION No. | Sec. | Twp. | Rge. | Elev. | Date of Survey | SNOW COVER MEASUREMENTS Snow Depth (Inches) | Water Content(Inches) 1953 | 1952 | 1951 | Past Record Years of Record | Av. Water Content (Inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LITTLE COLORADO RIVER | | | | | | | | | | | | |
| Forest Dale | 1 | 2 | 9N | 21E | 6000 | 2/13 | 0 | 0 | 0.9 | 0 | 13 | 1.0 |
| McNary | 2 | 14 | 8N | 23E | 7200 | 2/13 | 2.0 | 0.6 | 1.3 | T | 13 | 2.7 |
| Nutrioso | 3 | 23 | 6N | 30E | 8500 | 2/15 | 1.6 | 0.2 | 3.1 | 0.2 | 13 | 2.5 |
| Mormon Lake | 4 | 13 | 18N | 8E | 7350 | 2/12 | 4.4 | 1.5 | 6.7 | 0 | 6 | 6.9 |
| Fort Valley | 5 | 22 | 22N | 6E | 7350 | 2/15 | 2.6 | 1.0 | 6.8 | 0 | 6 | 3.6 |
| Gentry | 7 | 36 | 11N | 15E | 7600 | 2/13 | 2.6 | 0.4 | 5.2 | T | 3 | 3.0 |
| Heber | 8 | 28 | 11N | 15E | 7600 | 2/13 | 4.7 | 0.9 | 5.4 | T | 3 | 2.9 |
| Canyon Creek | 9 | 18 | 11N | 15E | 7500 | 2/13 | 5.6 | 0.9 | 7.8 | T | 3 | 4.1 |
| Mormon Mt. | 11 | 14 | 18N | 8E | 7500 | 2/12 | 8.1 | 2.9 | 9.2 | T | 3 | 5.2 |
| Happy Jack | 12 | 30 | 17N | 9E | 7630 | No Report | | | 7.7 | 0 | 2 | 3.9 |
| Average | | | | | | | 3.5 | 0.9 | 5.4 | T | | 3.6 |
| GILA RIVER | | | | | | | | | | | | |
| Frisco Divide | 1 | 31 | 6S | 20W | 8000 | 2/15 | 3.4 | 0.8 | 0.7 | 0.6 | 13 | 2.0 |
| State Line | 2 | 6 | 6S | 21W | 8000 | 2/15 | 1.7 | 0.4 | 1.4 | 0.2 | 13 | 2.9 |
| Nutrioso | 3 | 23 | 6N | 30E | 8500 | 2/15 | 1.6 | 0.2 | 3.1 | 0.2 | 13 | 2.5 |
| Coronado Trail | 4 | 26 | 5N | 30E | 8000 | 2/15 | 1.6 | 0.3 | 5.5 | 0 | 13 | 3.9 |
| Beaver Head | 5 | 13 | 4N | 30E | 8000 | 2/15 | 4.4 | 1.2 | 4.3 | 0 | 12 | 3.4 |
| Taylor Creek | 6 | 20 | 10S | 10W | 7850 | 2/15 | 0 | 0 | 0 | 1.0 | 10 | 0.7 |
| Inman | 7 | 6 | 11S | 10W | 7800 | 2/15 | 0 | 0 | 0 | 1.1 | 7 | 0.8 |
| Rose Canyon | 8 | 15 | 12S | 16E | 7300 | 2/15 | 0 | 0 | 0 | 0 | 5 | 1.3 |
| Bear Wallow | 9 | 6 | 12S | 16E | 8100 | 2/15 | 0 | 0 | 0 | 0.4 | 5 | 2.5 |
| Black Canyon | 10 | 8 | 13S | 11W | 6790 | 2/15 | 3.2 | 0.3 | New Course | | | |
| Mogollon | 11 | 2 | 11S | 19W | 7000 | 2/15 | 3.8 | 1.8 | New Course | | | |
| Average | | | | | | | 1.8 | 0.5 | 1.7 | 0.4 | | 2.2 |

TABLE 1

ARIZONA SNOW SURVEYS FEBRUARY 15, 1953

| DRAINAGE BASIN and Snow Course | LOCATION No. | Sec. | Twp. | Rge. | Elev. | Date of Survey | SNOW COVER MEASUREMENTS Snow Depth (Inches) | Water Content (Inches) 1953 | 1952 | 1951 | Past Record Years of Record | Av. Water Content (Inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WILLIAMS RIVER | | | | | | | | | | | | |
| Iron Springs | 1 | 22 | 14N | 3W | 6200 | 2/12 | 0 | 0 | 0 | 0 | 7 | 1.6 |
| Camp Wood | 2 | 3 | 16N | 6W | 5700 | 2/12 | 0 | 0 | 0 | 0 | 7 | 1.2 |
| Willow Ranch | 3 | 16 | 21N | 11W | 5000 | 2/15 | 0 | 0 | 0 | 0 | 7 | 0.6 |
| Average | | | | | | | 0 | 0 | 0 | 0 | | 1.1 |
| SALT RIVER | | | | | | | | | | | | |
| Forest Dale | 1 | 2 | 9N | 21E | 6000 | 2/13 | 0 | 0 | 0.9 | 0 | 13 | 1.0 |
| McNary | 2 | 14 | 8N | 23E | 7200 | 2/13 | 2.0 | 0.6 | 1.3 | T | 13 | 2.7 |
| Nutrioso | 3 | 23 | 6N | 30E | 8500 | 2/15 | 1.6 | 0.2 | 3.1 | 0.2 | 13 | 2.5 |
| Coronado Trail | 4 | 26 | 5N | 30E | 8000 | 2/13 | 1.6 | 0.3 | 5.5 | 0 | 13 | 3.9 |
| Milk Ranch | 5 | 28 | 8N | 23E | 7000 | 2/13 | 0.4 | 0.1 | 1.0 | 0 | 12 | 1.5 |
| Gentry | 7 | 36 | 11N | 15E | 7600 | 2/13 | 2.6 | 0.4 | 5.2 | T | 3 | 3.0 |
| Heber | 8 | 28 | 11N | 15E | 7600 | 2/13 | 4.7 | 0.9 | 5.4 | T | 3 | 2.9 |
| Canyon Creek | 9 | 18 | 11N | 15E | 7600 | 2/13 | 5.6 | 0.9 | 7.8 | T | 3 | 4.1 |
| Maverick Fork | 12 | 13 | 6N | 27E | 9050 | 2/14 | 12.2 | 4.2 | 16.2 | 3.0 | 3 | 8.7 |
| Baldy | 13 | 28 | 7N | 27E | 9000 | 2/14 | 14.2 | 5.3 | 13.0 | 3.0 | 3 | 6.6 |
| Ft. Apache | 14 | 18 | 7N | 27E | 9000 | 2/14 | 17.3 | 6.3 | 13.2 | 3.5 | 3 | 6.5 |
| Pacheta | 15 | | | | 7800 | No Report | | | 6.4 | 0 | 3 | 2.1 |
| Workman Creek | 17 | 33 | 6N | 14E | 5860 | No Report | | | New Course | | | |
| Average | | | | | | | 5.7 | 1.7 | 6.2 | 0.8 | | 3.8 |

TABLE 1

ARIZONA SNOW SURVEYS FEBRUARY 15, 1953

| Drainage Basin and Snow Course | LOCATION No. | Sec. | Twp. | Rge. | Elev. | Date of Survey | Snow Depth (Inches) | SNOW COVER MEASUREMENTS Water Content(Inches) 1953 | 1952 | 1951 | Past Record Years of Record | Av.Water Content (Inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VERDE RIVER | | | | | | | | | | | | |
| Iron Springs | 1 | 22 | 14N | 3W | 6200 | 2/12 | 0 | 0 | 0 | 0 | 7 | 1.6 |
| Camp Wood | 2 | 3 | 16N | 6W | 5700 | 2/12 | 0 | 0 | 0 | 0 | 7 | 1.2 |
| Mingus Mt. | 3 | 3 | 15N | 2E | 7100 | No Report | 0* | 0* | 0.6 | 0 | 6 | 2.0 |
| Mormon Lake | 4 | 13 | 18N | 8E | 7350 | 2/12 | 4.4 | 1.5 | 6.7 | T | 6 | 6.9 |
| Fort Valley | 5 | 22 | 22N | 6E | 7350 | 2/15 | 2.6 | 1.0 | 6.8 | 0 | 6 | 3.6 |
| Chalender | 6 | 27 | 22N | 3E | 7100 | 2/15 | 3.4 | 1.1 | 6.6 | 0 | 6 | 4.1 |
| Munds Park | 8 | 7 | 18N | 7E | 6500 | 2/12 | T | 0 | T | 0 | 3 | T |
| Casner Park | 9 | 19 | 18N | 8E | 6930 | 2/12 | T | 0 | 6.4 | 0 | 3 | 3.8 |
| Mormon Mt. | 11 | 14 | 18N | 8E | 7500 | 2/12 | 8.1 | 2.9 | 9.2 | T | 3 | 5.2 |
| Happy Jack | 12 | 30 | 17N | 9E | 7630 | No Report | | | 7.7 | 0 | 2 | 3.9 |
| Average | | | | | | | 2.1 | 0.7 | 4.4 | 0 | | 3.2 |
| LITTLE COLORADO RIVER | | | | | | | | | | | | |
| Bright Angel | 1 | 34 | 33N | 3E | 8400 | 2/15 | 20.5 | 6.2 | 14.8 | 3.7 | 5 | 8.6 |
| Grand Canyon | 2 | 21 | 30N | 4E | 7500 | 2/15 | 1.4 | 0.4 | 2.7 | 0 | 5 | 3.5 |
| Fort Valley | 5 | 22 | 22N | 6E | 7350 | 2/15 | 2.6 | 1.0 | 6.8 | 0 | 6 | 3.6 |
| Chalender | 6 | 27 | 22N | 3E | 7100 | 2/15 | 3.4 | 1.1 | 6.6 | 0 | 6 | 4.1 |
| Average | | | | | | | 7.0 | 2.2 | 7.7 | 0.9 | | 5.0 |

* Estimated

TABLE 2

STATUS OF RESERVOIR STORAGE, February 15, 1953

| BASIN and STREAM | RESERVOIR | USABLE CAPACITY (1000 A.F.) | THOUSANDS ACRE FEET IN STORAGE About Feb. 15 | | | | |
|---|---|---|---|---|---|---|---|
| | | | 1953 | 1952 | 1951 | 1950 | 10 Yr. Avg 1942-195 |
| Agua Fria | Lake Pleasant | 178 | 82 | 119 | 0 | 6 | 13 |
| Colorado | Lake Mohave | 1,810 | 1,574 | 1,593 | 1,402 | -- | -- |
| Colorado | Lake Havasu | 688 | 538 | 611 | 619 | 625 | 570 |
| Colorado | Lake Mead | 27,935 | 18,800 | 17,006 | 17,434 | 18,571 | 19,282 |
| Gila | San Carlos | 1,285 | 6 | 152 | 0 | 94 | 204 |
| Verde | Bartlett | 180 | 32 | 176 | 9 | 45 | 33 |
| Verde | Horseshoe | 143 | 1 | 45 | 1 | 11 | 9[a] |
| Salt | Roosevelt | 1,382 | 1,027 | 494 | 4 | 318 | 487 |
| Salt | Apache | 245 | 235 | 186 | 168 | 228 | 200 |
| Salt | Canyon | 58 | 54 | 43 | 50 | 34 | 30 |
| Salt | Saguaro | 70 | 43 | 44 | 48 | 22 | 21 |

a - Average for years 1946 through 1951.

## LIST OF SNOW SURVEYORS

| SNOW COURSE | SURVEYOR |
|---|---|
| Forest Dale | Chase, Declay and Olson |
| McNary | Chase, Declay and Olson |
| Milk Ranch | Chase, Declay and Olson |
| Casner Park | Goodwin and Griner |
| Munds Park | Goodwin and Griner |
| Mormon Mountain | Goodwin and Griner |
| Mormon Lake | Goodwin and Griner |
| Mingus Mountain | M. F. Jones |
| Iron Springs | E. Saxby |
| Camp Wood | Mrs. C. C. Merritt |
| Willow Ranch | T. Miller |
| Grand Canyon | Schuft and Major |
| Bright Angel | Valentine and Bateman |
| Fort Valley | A. P. Loska |
| Chalender | M. C. Oleson |
| Bear Wallow | Wm. Hughes |
| Rose Canyon | Wm. Hughes |
| Pacheta | Foch Phillips |
| Maverick Fork | Griner and Goodwin |
| Baldy | Griner and Goodwin |
| Ft. Apache | Griner and Goodwin |
| Taylor Creek | F. M. Inman |
| Inman | F. M. Inman |
| Coronado Trail | Forest Service |
| Nutrioso | Forest Service |
| Happy Jack | E. Ryberg |
| Workman Creek | C. L. Moore |
| Beaver Head | J. Burke |
| State Line | J. B. Shumate |
| Frisco Divide | J. B. Shumate |
| Gentry | Moody and Pattison |
| Heber | Moody and Pattison |
| Canyon Creek | Moody and Pattison |
| Mogollon | J. R. Wray |
| Black Canyon | E. Van Winkle |

The following organizations cooperate in the Arizona snow survey work:

FEDERAL

- Department of Agriculture
  - Forest Service
    - Apache Forest
    - Coconino Forest
    - Coronado Forest
    - Gila Forest
    - Kaibab Forest
    - Prescott Forest
    - Sitgreaves Forest
    - Southwestern Forest and Range Experiment Station, Fort Valley, Arizona
    - Sierra Ancha Experiment Forest Station
  - Soil Conservation Service
    - Division of Irrigation
- Department of Commerce
  - Weather Bureau
    - Arizona Section
- Department of Interior
  - Bureau of Reclamation
    - Region III
  - Geological Survey
    - Arizona District
  - Indian Service
    - Fort Apache Reservation
  - National Park Service
    - Grand Canyon National Park
- Gila Water Commissioner, Safford, Arizona

IRRIGATION PROJECTS

- Salt River Valley Water Users' Association, Phoenix, Arizona
- San Carlos Irrigation and Drainage District, Coolidge, Arizona

SOUTHWEST LUMBER MILLS, INC., McNary, Arizona

Other organizations and individuals furnish valuable information for the snow survey reports. Their cooperation is gratefully acknowledged.

Federal - State - Private

COOPERATIVE SNOW SURVEYS

—

Furnishes the basic data necessary for forecasting water supply for irrigation, domestic and municipal water supply, hydro-electric power generation, navigation, mining and industry

"WATER IS THE WEST'S GREATEST RESOURCE"